

APPENDIX F : POST-HARVEST PROCESSING

APPENDIX- F : POST-HARVEST PROCESSING

TABLE OF CONTENTS

	<u>Page</u>
F.1 Present Condition in Mekong River Delta	F - 1
F.1.1 General Condition.....	F - 1
F.1.2 Post-harvest Processing of Rice.....	F - 1
F.1.3 Post-harvest Losses.....	F - 5
F.1.4 Research and Development Agency	F - 6
F.2 Present Condition of Study Area	F - 9
F.2.1 General Condition.....	F - 9
F.2.2 Post-harvest Processing of Rice.....	F - 9
F.2.3 Other Processing Industry.....	F - 18
F.2.4 Training and Extension of Post-harvest Technology	F - 21
F.2.5 Result of Milling Test for Rice Samples.....	F - 24
F.3 Constraints in Post-harvest Processing.....	F - 26
F.3.1 General.....	F - 26
F.3.2 Post-harvest Processing of Rice.....	F - 27
F.4 Development Plan in Post-harvest Processing	F - 29
F.4.1 Objectives and Strategy	F - 29
F.4.2 Development Plan.....	F - 33
F.4.3 Recommendation	F - 39
Table F.1 List of Major Food Processing Factories in Mekong River Delta Area.....	F - 40
Table F.2 Rice Processing and Storage Facilities in the Study Area	F - 42
(Dong Thap Prov.)	
Table F.3 Rice Processing and Storage Facilities in the Study Area	F - 42
(Tien Giang Prov.)	
Supplement F.1 The Report on Milling Test for Vietnam Rice	F - 43
Supplement F.2 Comparison with Indonesian Rice.....	F - 51

APPENDIX-F POST-HARVEST PROCESSING

F.1 Present Condition in Mekong River Delta

F.1.1 General Condition

The agriculture, forestry and fishery sector is a major sector in the economy of Mekong River Delta (MRD). The growth of the sector contributed to the growth of other sectors including an agro-industry in recent years. The growth of this agricultural sector is mainly due to the production increase of rice which occupies about 50% of production and more than 90% of export amount of the whole country. Accordingly, agriculture production of this area has not been well diversified by introduction of vegetable, fruit, cash crop etc. Also, food processing industry occupies 70% of all production of industrial sector mostly brought by rice processing. Only 14 to 15 kinds of agricultural raw materials are used for processing¹. The list of processing factories for agricultural and fishery products excluding rice processing is shown in Table F.1.

As mentioned above, the post-harvest processing industry of agricultural products other than rice generally lagged behind in MRD. Existing processing facilities are not only insufficient in numbers but are old dated machinery with low technology of operation. Then the products qualities in those facilities are low and generate many losses. Recently, Ministries concerned are making effort to invest to SOE's factories but cannot protect the deterioration of those facilities.

Furthermore, there are very limited numbers of skilled workers. Technical level of workers is low without proper fundamental education in the processing factories as there is no vocational training school in many Provinces and no regular training program in the factories (Skilled worker shares only 20 – 30% among all workers even in the city¹).

F.1.2 Post-harvest Processing of Rice

The general condition of a post-harvest processing of rice in MRD Area is as follows.

(1) Threshing

Most of the paddy harvested is threshed by the power threshing machine. The diffusion of the units is comparatively high as one to 3 farmers (one to ten farmers in Red River Delta Area)²³. Beating method is practiced in a very limited remote area.

(2) Drying

¹ “Master Plan on Socio – Economic Development in Mekong River Delta to 2010”, June. 1996, MPI

² “Report on Situation and Policy of Rice Production, Processing and Consumption”, Oct. 1997, MARD

³ 8 threshers / 100 farmers in MRD by IFPRI Survey, 1995-96

Almost all paddy harvested is dried by sunshine. 76% of rice crop farming families are having a drying place in which 60% are made with concrete or a brick¹² and average area is 89 m²³. This method is economical but the quality of dried paddy is sometime not good containing no-uniform moisture, cracked or broken kernels and foreign materials such as clay and sand. And it often takes many days to dry up paddy to 14 – 15% moisture content under high humidity condition in MRD. Especially in the harvesting for Summer – Autumn in a rainy season, the losses due to germination and mold generation are very high. The losses are estimated 15 – 20%³.

The diffusion of a drying machine in MRD is extremely low. It is estimated that in 1997 about 1,500 units of a cheap drying machine of flat bed type were used in MRD. 1,200 units of drying machine are planned to be introduced by the aid of Danish Government in the coming three years*

***Outline of Post-harvest and rice processing Development Project (DANIDA Project)**

The Project starting in 1998 consists of two components and covering Can Tho, Soc Trang and Thai Binh Provinces. The condition in Can Tho Province is following:

<Component-1>

- 1.2M.US\$ is granted by Denmark Government to spread dryers to farmers.
- The three types of dryer were designed and selected by University of Agriculture and Forestry in HCM City for the Project.

	Type	Cap.	Cost(M.VND)	Collateral
1	Double cylinder by bamboo net	1t/70hrs	1.1	Such as house
2	Flat bed	4t/8hrs	30	More than 0.6ha of field
3	Flat bed	8t/hrs	40	More than 1ha of field

- Credit period: 3 years, Interest: 0.7%/month
- More than 400 applications were received by Oct. 1999 where about 280 dryers were installed after inspection of applicant's condition for requirements such as ability of repayment. The fund is reused as revolving after repayment.
- No. 2 and 3 among above three are popular which the farmers use not only for their product but for neighboring farmers products getting charge of 5% of drying quantity.
- The dryer is mainly used for S-A crop and has not been extended to use for other season crop.
- Traders buy the product dried by this facility by 50 – 100 VND/kg higher than ordinary price. It is explained that the borrower can repay by 20 days operation per year of 2 shifts / day including consignment service.



<Flat bed dryer (No. 2)>

<Component-2>

- The modern rice mill was constructed by 4,338,000US\$ granted by Denmark Government, which is a property of Provincial Government.
- Capacity: 6t/hr. Vertical dryer and color sorting machine are also equipped.
- It has just started a test operation and is planned to produce high quality rice through producing high quality rice in the surrounding area in future.

(3) Storage

The producers store their paddy harvested in their house or within their resident area. 55 – 60% of

¹ “Priorities and Constraints of Postharvest Technologies in Vietnam”, Sept. 1998, Dr. Le Van To, PHTI

² “Rice Market Monitoring and Policy Options Study”, Oct. 1996, IFPRI

³ “Report on Situation and Policy of Rice Production, Processing and Consumption”, Oct. 1997, MARD

producers have some kind of storages¹² and their average capacity is about 6 tons¹.

Total capacity of storage in market channels is 1,195,500 tons and the break down is as follow¹.

Permanent warehouse	971,000 tons	(81.3%)
Semi-permanent warehouse	184,500tons	(15.0%)
Temporary warehouse	40,000tons	(3,7%)

Among the figure above, the storage of 577,846 tons (48%) belongs to Southern Vietnam Food Company (SVFC) excluding the capacity of storage in Ho Chi Minh City. There are many warehouses not well utilized due to overage and wrong location to market channels. Agricultural Department estimates that one third of warehouses need repairs and 100,000 tons shall be sold according to their evaluation result².

Loading and unloading work in the warehouse is carried out by manpower and volume is measured every 1 bag with a platform scale. Like this, the quality of existing warehouses is generally low and their operation is inefficient.

(4) Milling and Polishing

Rice milling and polishing are the most advanced ones in agro-processing industry in MRD. As of 1997, there are about 8,000 rice mills in MRD that can process 20,654 tons / shift, eight hours and 11,000,000 tons annually. Big rice mills mainly belong to VSFC and provincial governments, break down of which is as follow²:

Rice mill	No.	Cap./8hrs	Cap./year	%
SOEs	106	1,757 ton	913,640 ton	8.5
Private	7,891	18,897 ton	9,826,440 ton	91.5
Total	7,997	20,654 ton	10,740,080 ton	100.0

Rice mill is classified into small (below 1 ton), medium (1 – 10 tons) and big (above 10 tons) based on processing capacity. Other than this classification, there are rice mills attached to polishing facility and factory having only polishing facility. In MRD, small and medium rice mill shares 80% and the rest 20% belong to big mill with a polishing facility. Rice mills with polishing facility tend to have relatively big capacity of warehouses and big numbers of permanent labors¹².

Polishing for export rice is mainly carried out in SOEs which have the total capacity of 977,600 tons / year of which 72% (703,872 tons / year) are dealt by mills under VSFC¹.

In MRD, there exist industrial areas concentrated by rice mills for export as follows²:

¹ “Rice Market Monitoring and Policy Option Study”, Oct. 1996, IFPRI

² “The Project on High Quality Rice Production Area for Export in Mekong River Delta”, Sept. 1998, MARD

No.	Industrial area for export rice	Province
1	Tan An, Ben Luc	Long An
2	<i>Tran Quoc Toan, Sa Dec</i>	<i>Dong Thap</i>
3	<i>Cai Be, Cai Lay</i>	<i>Tien Giang</i>
4	Chau Phu, Long Xuyen	An Giang
5	Tra Noc, Phung Hiep	Can Tho
6	Ving Long	Ving Long

Note: *Italics* belong to the Study Area

Equipment for improving the quality of rice such as polisher are installed in the rice mills for export, and the details are as follows¹:

Kind	No.	Total Cap. / 8 hrs	Total Cap. / year
Polisher	352	8,448 tons	4,392,960 tons
Color Sorter		36.2 tons	18,824 tons
Dryer		186.7 tons	97,084 tons

All equipment used in rice mills are local made, except some big rice mills such as SATAKE rice mills and ANGIMEX-Kitoku's rice mill, a joint venture company with one of Japanese rice wholesalers named Kitoku. The color-sorting machine is not produced locally and imported from abroad in a limited number of rice mills. Those equipment used in rice mills are copies of products in various countries such as Japan, Taiwan, China and Germany and rice mill is like a show case of various copies.

(5) Constraints of Rice Mill

Although there is sufficient processing capacity for milling and polishing rice for export as shown above, the constraints are as follow^{2,3,4,5}.

- More than a half number of rice mills are old and produce low quality rice by low recovery rate.
- Recovery rate of whole rice and broken rice is 60 – 66% and of whole rice is 40 – 48% only, 5% to 10% lower than modern processing, due to low capacity of a old facility, mixing of damaged rice and high moisture content. As a result, the competitiveness in the international market is weak.
- The rice mill for export is mainly composed of four stages, namely husking, whitening, polishing and mixing. The rice mill having four stages has not been popular yet and their numbers are limited, compared to the numbers of general rice mill with two processing

¹ "Rice Market Monitoring and Policy Option Study", Oct. 1996, IFPRI

² "The Project on High Quality Rice Production Area for Export in Mekong River Delta", Sept. 1998, MARD

³ "Report on Situation and Policy of Rice Production, Processing and Consumption", Oct. 1997, MARD

⁴ "Storage and Processing Rice for Export in Mekong River Delta", Aug. 1998, MARD

⁵ "Priority and Constraints of Postharvest Technology in Vietnam", Sept. 1998, Dr. Le Van To, PHTI

stages.

- Almost all rice mills concentrate their operation to harvesting season and reduce operation rate through out a year, that is 50 – 60% to designed capacity, due to small capacity of warehouses attached to rice mills and lack of fund for raw material procurement.
- There are rice mills located in wrong place for procurement of raw material and transportation of products.
- Paddy, brown rice and milled rice are used together as raw materials for export rice mills. This situation induces meaningless competition among rice mills due to lack of proper procurement system, and is not caused by a proper adjustment between supply and demand in a market.
- The management in rice mill operation is extremely insufficient in view of technology and economy.
- Managers and engineers in rice mill have limited knowledge and ability for proper operation by lack of technical and economic training opportunities.

F.1.3 Post-harvest Losses

In many documents, various figures are refaced on post harvest losses occurred in Vietnam. These loss assessment figures need to be judged and utilized, confirming their assessment methods, because there is not unified standard of the assessment method.

The study carried out by General Statistics Office and Post-harvest Technology Institute (PHTI) or the nation wide basis and compiled by MARD in 1997 is shown below:

Losses of rice:

Stage	Loss(%)
Harvesting	1.3 – 1.7
Transportation	1.2 – 1.5
Threshing	1.4 – 1.8
Drying	1.9 – 2.1
Storage	3.2 – 3.9
Milling	4.0 – 5.0
Total	13.0 – 16.0

Losses of other crops:

Crop	Loss(%)
Maize	18 – 19
Tuber crop (Cassava, Sweet potato, Potato)	20 – 22
Beans (including Ground nut)	19 – 20

Vietnam has increased rice production and export rapidly in recent years and now 2nd largest exporter after Thailand. However, attention has not been paid duly the loss of product. As a result, the post-

harvest losses of rice are considerable not only in quantity but in quality, and these the lower price in an export market.

F.1.4 Research and Development Agency

The research and development agencies concerning post-harvest processing for agricultural products in MRD Area are as follows:

(1) Post-harvest Technology Institute in Ho Chi Minh City

Location: Ho Chi Minh City
Competent authority: MARD
Staff: About 250 engineers

Major activities:

- a. Research and transfer technologies for storage, processing of food, foodstuff, fruits and vegetables

R & D works of storage and processing for various products have been carried out by the financial assistance by the donors such as Australian Government and French Government. The Institute has used the results of these activities for commercial production even in small scale and the products are sold to foreign countries as well as in domestic market. Such products are dried foods (noodle, vegetable etc.), convenience foods (noodle, rice porridge, soup etc.) and bottled foods (Coconut juice pudding, pickles etc.).

Additionally, the machinery manufacturing department is attached this Institute and develops and makes necessary machinery and equipment for the above activities.

- b. Analyzing aflatoxin and pesticide residue in vegetable, fruits, agro-products and food by rapid biological methods.
- c. Consulting and training on post-harvest technologies

Training and extension activities for post-harvest technology are carried out frequently by requests from Provincial Governments, private companies etc. on the condition of all expenditures owed by clients. For example, the training chemical treatment of Longan was carried out in My Tho by the request of Tien Giang Province.

During our study period, the Institute was carrying out post harvest loss assessment study for rice in six Provinces by the assistance of French Government and the report will be compiled by the end of this year. These Provinces are Tien Giang, Dong Thap, Long An, Can Tho, An Giang and Soc Tran.

- d. International relationship

The Institute has established relationship to scientific organizations and international programs such as Aus AID, ACIAR, SEARCA, JIRCAS, and FAO.

From Nov. 9 to 12 1999, the Institute held a International Seminar titled “19th ASEAN and

1st APEC Seminar on Postharvest Technology / Quality Assurance in Agricultural Produce” in HO Chi Minh City.

(2) Food Industry Research Institute in Ho Chi Minh City

Location: Ho Chi Min City (Head Office: Hanoi)

Competent authority: Ministry of Industry

Staff: 15 (About 150 experts including in the Head Office)

Major activities:

- a. Studying scientific and technological development strategy and policy on food industry
- b. Overseeing the implementation of projects and themes on scientific and technological research
- c. Training workers, technical staffs, tertiary and post-graduates.
These activities are mainly carried out by the request of private enterprises.
- d. Establishment of data base and information network
- e. Establishment of technological process, talking part of Branch and State standards, quality control of food products
- f. Developing co-operative relations on bio-scientific and technological research and production designing and manufacturing equipment and technology transfer

As the Institute has many experience in the field of fermentation industry, the major achievements of technology development are: soft drinks, alcohol drinks, soy bean processing, edible oil, glucose-syrup, nutritional food, storage and processing of fruits and vegetables, feed, bio-insecticides, methods of quality control and waste water treatment.

As Tien Gian Vegetable Oil Company started to consider the introduction of Rice Bran Oil Mill upon receipt of approval by Provincial Government; the Institute is giving their technical advice. It will be the first rice bran oil extraction factory using organic-solvent in Viet Nam it realized.

(3) University of Agriculture and Forestry in Ho Chi Minh City

Location: Ho Chi Minh City

Major activities:

The post-harvest technology is taught students and R & D activities are carried out for machinery and equipment concerned in the faculty of engineering that contributed to develop several type of dryer for DANIDA Project.

(4) Can Tho University, Faculty of Agriculture

Location: Can Tho City

Major activities:

The post-harvest technology is taught students and R & D activities are carried out for

machinery and equipment concerned in the course of engineering.

There is no extension service program for post-harvest technology to the public sector due to lack of fund.

Conclusion

These organizations are facing the shortage of turned to carry out desirable activities for R & D and extension of technology. Under such situation, the Post-Harvest Technology Institute is rather exceptional. The institute is carrying out large and various activities vigorously, having their own way for income generation and receiving financial cooperation from outside.